SCIENCE NEWS

Science Service, Washington, D. C.

PROFESSOR EINSTEIN'S NEW THEORY

PROFESSOR Albert Einstein, from the Institute for Advanced Study at Princeton, N. J., has announced a new theory which should profoundly affect the whole structure of physical science. Continuing his world-recognized rôle as scientific "coordinator," Professor Einstein offers the first mathematical "signposts" which may point the way to a welding of his own famous relativity theory and the new quantum theory into a single, more powerful tool for science. Both relativity theory and quantum theory have been of such fundamental importance that the men who devised them have won the highest award in science—the Nobel prize.

Here are the outstanding, startling concepts in Professor Einstein's new and yet-unnamed theory: (1) Space is pictured as two sheets. (2) Particles in space are envisioned as "bridges" linking the two sheets. (3) The most elementary particle in nature is one without gravitating mass, *i.e.*, without weight. (4) Electricity and mass are not related but appear as independent constants in the equations.

In a report to *The Physical Review*, the official publication of the American Physical Society, Professor Einstein, with Dr. N. Rosen as collaborator, describes how his own general relativity theory accounts for the large-scale happenings of nature, but fails when attempting to explain the atomic structure of matter. At the same time, he adds, quantum theory, while highly successful in describing the interactions of atoms and their still smaller parts, fails to explain phenomena in the field of relativity. At present, depending on the job at hand, science chooses either one or the other theory as a "tool." In analogy science is now working like a carpenter who uses a saw to cut wood and a hammer to drive nails.

Professor Einstein, in trying to combine the two theories, would like to have science (as a carpenter) have one tool which both cuts wood and drives nails.

Sufficiently complex in its mathematical details to tax the ingenuity of the legendary twelve men who were originally said to understand Einstein, the new theory pictures space as represented by two sheets. The presence of an elementary particle without electrical charge in this space is represented as a "bridge" connecting the two sheets. With the help of this "sheet-space and bridge" picture, "one is able to understand the atomistic character of matter as well as the fact that there can be no particle of negative mass," Professor Einstein reports.

An important and unusual outcome of the new theory is that the "most natural electrical particle in the theory is one without gravitating mass," to use Professor Einstein's own words. A particle without gravitating mass would be one which weighs nothing. This state of zero mass is represented by one "bridge" between the two sheets of space. An electron or proton, according to the theory, would be a "two-bridge" problem.

Still another conclusion reached by the new theory is that the mass of a particle like an electron is not related to its electric charge. The charge (e) and the mass (m) are independent constants of integration, to use the mathematician's term.

In his analysis of his own new theory, Professor Einstein gives as points in its favor: (1) It explains the atomistic character of matter; (2) it explains the circumstance that no neutral particles of negative mass exist; (3) it uses no other variables in the equations than those of the gravitational field and the electromagnetic field.

"On the other hand," Professor Einstein concludes, "one can not see *a priori* whether the theory contains the quantum phenomena. Nevertheless one should not exclude *a priori* the possibility that the theory may contain them." Which, in effect, means that while the new theory does not, at present, explain atomic happenings as does quantum theory, one should not jump at the conclusion that there is no possibility that it may do so.

The following is Professor Einstein's description of his new theory in his own words: "The writers investigate the possibility of an atomistic theory of matter and electricity which, while excluding singularities of the field, makes use of no other variables than the gravitational field variable of the general relativity theory and the electromagnetic field variable of the Maxwell theory. By the consideration of a simple example they are led to modify slightly the gravitational equations which then admit regular solutions for the static spherically symmetric case. These solutions involve the mathematical representation of physical space by a space of two identical sheets, a particle being represented by a 'bridge' connecting these sheets. One is able to understand why no neutral particles of negative mass are to be found. The combined system of gravitational and electromagnetic equations are treated similarly and lead to a similar interpretation. The most natural elementary charged particle is found to be one of zero mass. The many-particle system is expected to be represented by a regular solution of the field equations corresponding to a space of two identical sheets joined by many bridges. In this case, because of the absence of singularities, the field equations determine both the field and the motion of the particles. The many-particle problem, which would decide the value of the theory, has not yet been treated."

ECLIPSE OF THE MOON

FOR the first time since November 27, 1928, for people in most parts of the United States, a total eclipse of the moon will be visible during the night of Monday, July 15. Until 9:15 P. M., eastern standard time, the moon, full as always at the time of its eclipse, will be seen shining with its usual splendor. At that time it will start to enter the outer part of the earth's shadow, called the penumbra, but hardly any effect will be noted until nearly an hour later. During this time a person on the moon would see the dark disk of the earth partly covering the sun, but still so much sunlight reaches the moon that its

brilliance is hardly affected. At 10: 12, however, the moon begins to enter the umbra, the dark inner shadow of the earth, whose circular outline can be seen on the lunar surface, as the sunlight begins to be cut from it completely.

After its first appearance on the eastern edge of the moon, the earth's shadow will creep across until completely covering it at 11: 09. From that moment until 12: 50 A. M. on the morning of the sixteenth, the moon will be in total eclipse. At 1: 47 A. M. it will emerge completely from the umbra, and at 2: 43 A. M. from the penumbra, bringing the eclipse to an end. It will be visible from all North and South America, Western Europe and Africa, and a large part of the Pacific Ocean.

Even at midnight, when the eclipse is at its middle, the moon will not completely vanish from sight, but will shine with a peculiar copper red color. This is due to the earth's atmosphere, which acts like a prism, and bends some of the sunlight around into the shadow, to illuminate the eclipsed moon. As sunlight passes through the air, some of its blue rays are extracted, producing our blue sky. With these rays gone, the light which passes through is predominantly red and is responsible for the eclipsed moon's color. A similar effect accounts for the red color of the setting sun, but then the light does not pass through as great a thickness of atmosphere as that which reaches the moon at eclipse time.

To the imaginary observer on the moon during its eclipse, the sun would be hidden by the earth's dark disk, but around it would appear a brilliant ring of red, due to this atmospheric refraction. At rare intervals, however, it might happen that a complete ring of opaque clouds would encircle the earth in the particular part of the atmosphere where the sun's light is passing through. Thus, there have been eclipses of the moon when it did go out of sight completely.

X-RAYS AND THE GROWTH OF TISSUES

X-RAYS' growth-stopping effects have been critically studied on healthy animal tissues that would ordinarily regenerate themselves, by Dr. Pressley Lee Crummy, working under direction of Dr. H. H. Collins at the University of Pittsburgh. These studies throw light on two regions of biological interest: they furnish a basis for comparison between x-ray effects on normal and abnormal growing tissues such as cancer, and they add information on the curious phenomenon of regeneration, by which certain of the lower animals are able to replace lost body-parts such as tails and legs.

Dr. Crummy experimented on the spotted newt, a long-bodied, long-tailed relative of the more familiar frogs and toads. Amputating the tail-tips of some of these animals, he rayed the cut ends of part of them with appropriate dosages of x-rays at various time-intervals. The others he left unrayed, as "controls." After some weeks he examined the lot.

The "control" animals were found to be going through the normal regenerative procedure, growing themselves new tails as they would after an accident in nature. The rayed newts, on the other hand, were still stump-tailed as the amputation had left them; they had averaged only about a millimeter of new growth—about the thickness of an ordinary knifeblade.

A strange differential effect was observed. Dosages sufficient to inhibit regeneration completely when given immediately after operation would not stop regeneration when administered some weeks after regeneration was under way. The delayed dosage, however, was found to slow up the growth rate of the limb and to cause abnormalities in the formation of the fingers.

In preliminary experiments, Dr. Crummy tried raying the very tips of some of the newts' tails. Without exception, a degeneration and sloughing off of the tissues took place, reminiscent of the loss of finger-joints suffered by early workers with x-rays, before their destructive powers were known.

In the experiments, of course, due consideration was taken for the feelings of the newts. The operations were performed under anesthesia, and their bodies, except for the parts to be x-rayed, were protected during treatment under a quarter-inch lead shield. Apparently it doesn't bother a newt to lose a piece of leg or tail—perhaps a compensation of Nature for having them bitten off by hungry fish or snapping-turtles. At any rate, they seemed to be quite contented without them, while they grew replacements, and incidentally, furnished biologists with excellent material for fundamental studies of growth phenomena.

COASTAL EROSION

DISCUSSIONS which may lead to a truce in the relentless warfare between sea and land will be the order of the day when the American Shore and Beach Preservation Association, a body of engineers and public officials attempting to work out a science of coastal erosion, meets in convention at Ocean City, N. J., on July 11, 12 and 13.

The association was organized in 1926 to find solutions to the problems of thousands of owners of summer cottages along the Atlantic Coast, who often found their summer homes reduced to driftwood by winter gales which lashed the beaches. Houses were built in many cases too close to the high water line, in the mistaken idea that the most desirable seashore property was that which was within a stone's throw of the sea. Owners too often woke up to find the sea at their doorsteps.

Captain R. S. Patton, director of the U. S. Coast and Geodetic Survey and director of the association, is of the opinion that scientific research alone can provide a permanent answer to beach erosion problems. In a recently released paper, he stresses the fact that the present practice of building bulkhead or protective structures which minimize the effects of the waves can only slow down the erosion and can not effect a permanent solution to the problem. The alternative of an offshore breakwater parallel to the beach, which causes the waves to break where they can do no harm, he finds too expensive to be practical. What should be done, according to Captain Patton, is "to bring together a small, carefully selected group of men, trained in research," who will accumulate a foundation of reliable data, which is now entirely lacking. "If we find good men and assure them a free hand

in sympathetic support, we need not fear that they will not produce worthwhile results."

Governor Harold G. Hoffman of New Jersey, Brigadier-General George B. Pillsbury and Senators Harry Moore, W. Warren Barbour and George L. Radcliffe have signified their intention to attend the conference, according to J. Spencer Smith, president of the association and chairman of the New Jersey State Board of Commerce and Navigation.

THE TESTING OF THE DURABILITY OF CONCRETE

MORE than a century of the ravages of time and weather have been simulated in the thousand cycles of freezing and thawing of concrete specimens recently completed in the research laboratory of the Portland Cement Association at Chicago.

The reaction to severe winters is one of the measures of the durability of a structural material exposed to the weather. In the laboratory tests, specimens of concrete of various shapes and sizes go from tropical warmth to the middle of a hard winter and back again in a twenty-four hour period.

The specimens to be tested are immersed in water containers and placed in a freezing room where it is always 20 degrees below zero. Then they get a thawing in a tank where the water is kept at 80 degrees.

After twenty or thirty cycles, the specimens are dried and weighed to determine whether there has been any deterioration or spalling of the surface. The original weight of each specimen is carefully recorded and periodical weights are determined as long as the tests continue, which is sometimes for years.

This is only one of the phases of the research work constantly going on in the laboratories of the Portland Cement Association. Scientific data obtained through its research laboratories and by its fellowship men at the National Bureau of Standards are made available to engineers and contractors so that the quality of concrete may be constantly improved.

ITEMS

THE Mexican coast 250 miles west southwest of Mexico City was rocked by an earthquake at 1: 49 A. M., on June 29. "Very clear" and "fairly strong" was the description of the shock reported by seismological stations throughout North America. The epicenter was located at 18 degrees north latitude and 103.3 degrees west longitude, according to calculations made by the U. S. Coast and Geodetic Survey from telegraphic data supplied by Science Service. This would make the shock center just a few miles off the coast where the Mexican continental shelf drops rapidly off into the depths of the Pacific Ocean.

FOR more than an hour, the bright star Antares will hide behind the moon on Friday evening, July 12, according to computations made at the Nautical Almanac Office of the U. S. Naval Observatory. The moon will be in a gibbous phase, half way between first quarter and full. At 8: 22 P. M., Eastern Standard Time, astronomers in Washington will see the star vanish suddenly as it is covered by the moon's dark edge. At 9: 44 P. M., it will be uncovered, and the star will reappear from the moon's opposite, and bright, limb. In other parts of the country, the times will differ from these by a few minutes. Such occultations of a bright star are rare, and are observed by astronomers because they permit a very accurate check on the moon's motion. Antares is the bright red star in the constellation of the scorpion, in the southeastern evening sky.

DR. PURCELL G. SCHUBE, of the Boston State Hospital, has found that sodium rhodanate, contrary to claims advanced for it, is of no value in treating mental disease. His opinion, based on experience with 75 patients suffering from various mental disorders, is reported to the current issue of *The American Journal of Psychiatry*. The sodium rhodanate treatment was advocated by Professor W. B. Bancroft, of Cornell University, who suggested that mental disease can be explained by the dispersion of the brain colloids. Dr. Schube found, contrary to Professor Bancroft's views, that it is impossible to differentiate between two types of mental disease, dementia praecox and manic-depressive psychoses, by the contrasted use of sodium amytal and sodium rhodanate. He writes: "The ideas of Bancroft and his co-workers relative to mental disease and the methods of treating it did not prove to be of any value at all when the experimental method was applied to them."

THE unexplained disappearance of a deadly lethal factor from its hereditary make-up has made possible the appearance of an unusual new type of evening primrose among the experimental plants of Dr. George H. Shull, professor of genetics and botany at Princeton University. The new variety, which put in its appearance for the first time this spring, is characterized by leaves whose petioles or leaf-stems are longer than the blades of the leaves themselves. They form a marked contrast to the normal leaf, which is over ten times as long as its leaf-stem or petiole, and for this reason Dr. Shull has named the new variety *Oenothera petiolaris*.

A TWO-THOUSAND square mile blind spot, in southwestern Yukon Territory, a region of lofty mountain ranges and deep glacier-filled valleys and gorges, has been erased from the map of North America, according to Bradford Washburn, leader of the Yukon Expedition of the National Geographic Society, who has just returned to Washington to make his report to Dr. Gilbert Grosvenor, president of the society, after four months in the field. The crossing afoot for the first time of the St. Elias Range near the border of Alaska and the Yukon, was an outstanding feat that tested the stamina of the men. Several immense new mountain peaks were discovered while *en route* over this range and their positions located with surveying instruments. At one time, Mr. Washburn said, the expedition carried cameras and surveying instruments to a height of more than 12,000 feet on Mt. Hubbard and set up the highest survey station ever occupied in Canada or Alaska.